THERMOLUMINESCENCE FEATURES IN DIFFERENT OLIVINE GRAINS FOR ZAGAMI METEORITE. L. L. Kashkarov[1], A. I. Ivliev[1], and L. M. Bulgakova[2], [1]V. I. Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences, 117975 Moscow, Russia, [2]Geology Department, Moscow State University, Russia.

Recently [1], a track investigation was proposed for the martian meteorite Zagami [2], which underwent a complicated radiation-thermal history. At that time the preliminary thermoluminescence (TL) data did not suggest any definite conclusion for the olivine grains under investigation. We have acquired some new TL data for the six large (up to ~8 mm) isolated olivine grains picked from the Zagami meteorite. These data are presented in this report.

The glow curves for the natural and X-ray- (E_x = 55 keV) and gamma-ray- (E = 0.6 MeV) induced TL were measured. For this purpose, clean monomineral olivine grains were crushed to tens of micrometers in size and placed on thin Ni-foil disks, which were placed on the Pt strip heater. The procedure that was followed has been described earlier [3]. At least four types of glow curves were observed for the natural TL (Fig. 1a). These TL curves were processed according to special mathematical programs [4,5]. These calculations allow us to represent glow curves as a set of 11 Gauss peaks with a constant peak full width at half maximum (FWHM). Some results of the mathematical treatment of these glow curves as the ratio of intensities (I) of TL values for different temperature intervals are shown in Fig. 2. The ratio values of $R = I_{p(1-4)}/I_{p(7-9)}$ [interval of temperatures p(1–4) = 120°–220°C and p(7–9) = 220°–300°C], for example, vary from ~0.2 to ~0.4 for samples No. 1 to No. 4. Because the total TL intensity level for these olivine grains is about the same, the very different shapes of the TL natural glow curves can be explained as due to different crystal microstructure. As a result it gives correspondingly different probabilities for electron capture at certain energy levels [6]. From this position it was important to compare the parameters of artificially induced TL for these samples. X-ray irradiation gives TL glow curves of analogous form for all samples (Fig. 1b) with a clear low temperature, T_{peak} = 130°C. However, R values in this case vary for the two intervals investigated (Fig. 2). A lower value is seen for the gamma-ray-induced TL glow curves, for which T_{peak} is seen at ~160°C and ~310°C (Fig. 1c). Nevertheless, the total behavior of R values for X-ray and gamma-ray irradiation is similar: R values for gamma-ray TL also vary in the two intervals, although absolute values of R are two to three times lower for the gamma-ray-induced TL than for the X-ray-induced TL (Fig. 2).

The obtained results suggest that natural, X-ray- and gamma-ray-induced TL parameters for the monomineral igneous olivine grains from Zagami can be explained with the help of the influence of shock-thermal processes on the crystal microstructure, which was very different in individual olivine grains.

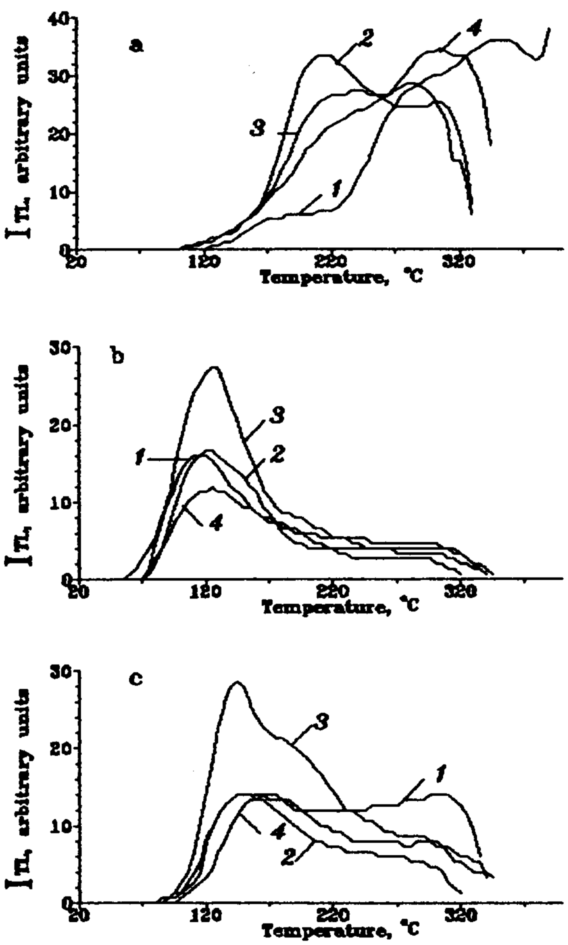

Fig. 1. Glow curves for olivine samples: **(a)** natural TL; **(b)** TL induced by X-ray and **(c)** gamma-rays. 1–4 = number of olivine samples.

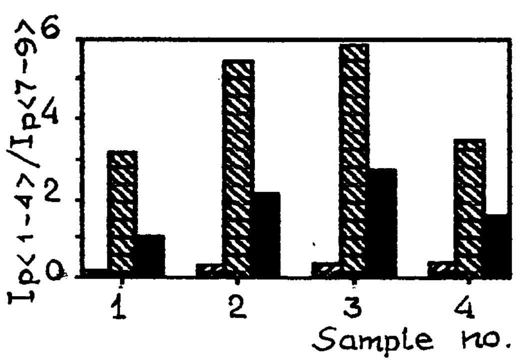

Fig. 2. Histogram of R value for olivine samples (natural, X-ray, and gamma-ray TL).

Consistent with this it is known [7] that in the shock process pressures can be up to 35 GPa. Thus, the Zagami meteorite possibly originated in a high-pressure heating impact event, which is probably reflected partly in the specificity and nonuniformity of TL characteristics of the large olivine grains.

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